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TUTIRA[1]

Anyone who appreciates a narrative of energy, persistence, and indomitable struggle against seemingly insuperable difficulties will enjoy this stirring history of Tutira, a sheep station of about 100 square miles in the North Island. The ecologist especially will find in it a graphic account of the vegetation before settlement 49 years ago, of the immigration of an alien flora and fauna, and of the great changes which have ensued under the influence of man and sheep. Almost half of the book is strictly ecological, a small portion is devoted to physiography and geology, and the balance to the history of the station.

The author modestly disclaims scientific erudition, but a perusal of the book proves that he is not only an ecologist, but an observer of remarkable discrimination who has had unusual opportunities to see ecological processes at work and has faithfully recorded facts for forty years. He has the dynamic viewpoint to a degree: with him plants and animals are continually increasing or decreasing in numbers, immigrating or disappearing, dominating or sinking into insignificance, as environmental factors change. We all *believe* in succession, but none of us actually *sees* much of it. The author, however, has seen stage after stage pass on his own land, and understands the cause of each. To be sure, succession in Tutira has been hurried by the action of man, but the essential processes remain the same.

In prehistoric times the land was covered by a heavy podocarp forest. Some trees still remained in 1882, but most were represented only by fallen or buried logs. The removal of the trees is attributed to fires started by the Maoris within the last four centuries. When the author first settled on the station, less than 3 percent of its area was forested, smaller amounts were in flax (*Phormium*) and cat-tail, and the balance was a vast sea of bracken fern. The subjugation of the bracken was carried on through crushing by sheep, followed by burning; and attempts were made to naturalize various forage plants by broadcast sowing after the fires. The latter was not successful, and the repeated fires led to an extraordinary development of manuka (*Leptospermum scoparium*), which soon became more troublesome than the bracken had been previously. It was finally subdued by changing the annual burning from fall to spring, and with its suppression came a great development of the native grasses *Microlaena stipoides* and *Danthonia semiannularis,* which remain the most important forage plants today.

While almost 250 alien plants have appeared at Tutira, most of them are confined to the neighborhood of houses, roadsides, gardens, and the like, and show little or no ability to compete with the native vegetation. Alien grasses, even when encouraged, have not become important for forage. This condition is, of course, essentially like the behavior of alien plants in America, but just the contrary of what we have always believed of New Zealand since the early statements of Hooker. Only one alien plant, the blackberry (*Rubus fruticosus*), has become dangerous to the sheep industry. For practically every one of these aliens the author can record the year and place of its first appearance and the details of its further history. For most of them he knows the exact means by which they reached the station, and for the alien animals also the migration route followed.

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[1] Guthrie-Smith, H., "Tutira, the Story of a New Zealand Sheep Station." Pp. xxi + 400. 22 plates, 127 text figures, 16 maps. William Blackwood and Sons, Edinburgh and London, 1921. 42 shillings.

All these facts are presented readably, without attempts at theorization, and the whole book is a mine of ecological information.

H. A. GLEASON

NEW YORK BOTANICAL GARDEN

STREAM POLLUTION[1]

This paper is a valuable contribution to the literature of stream pollution. The subject is treated in general and the results will be found applicable to any body of water. The subject matter is treated under such headings as Polluting Materials, Fish Requirements, Zone of Recent Pollution, Septic Zone, Zone of Recovery, Clean Water Forms, Tolerant Forms. Figures are given of the various types of animal and plant life that is characteristic of different degrees of pollution. There is a good but not exhaustive list of references.

The reviewer takes exception to some of the molluscan types cited (plate IV). Goniobasis and Campeloma are not, as a rule, tolerant forms, although they may be found in slightly polluted waters, as may many other types of animals. The little clam Pisidium is usually an inhabitant of clean water and is by no means tolerant. The Pulmoniferous water snails are very tolerant because they take free air. We believe that the fresh-water mussels are good indicators of degrees of pollution, and when they cease to be present in a stream normally fitted for them the pollution may be deemed to be bad. Bottom-inhabiting animals normally inhabiting clean water are good indicators, because they can not get away and must become tolerant or perish. Recent studies in an Illinois stream, covering a distance of nearly 50 miles, in which the sewage of two cities is emptied, indicated clearly that both naiads and crawfish were notably affected by these conditions, the naiads being the less tolerant.

In another place[2] the reviewer presented a study of the Genesee River, at Rochester, N. Y., a heavily polluted stream, showing that the water-breathing snails were the first to give out, not being tolerant, and the air breathers were quite tolerant, in fact remaining until the water was the consistency of dish water before being driven out.

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[1] Suter, Russel and Emmeline Moore, "Stream Pollution Studies." State of New York, Conservation Commission, 1922, pp. 1–34, many figures.

[2] American Naturalist, LIV, pp. 152–161, 1920.